

Psychological Bond Beyond Algorithms: A Latent Profile Analysis of Multifocal Commitment among Food Delivery Riders

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Abstract. In the context of the platform economy, the labor process of food delivery riders is deeply embedded in algorithmic management, and their psychological bonds simultaneously involve three dimensions: the platform, trade unions and the occupation itself. Based on data collected from 208 food delivery riders through a two-wave time-lagged design, this study adopted latent profile analysis and identified four types of multifocal commitment profiles, namely the Platform Commitment-dominant Type, the Platform-Trade Union Dual-dominant Type, the Trade Union-Occupation Dual-dominant Type and the Full Commitment Type. These profiles reveal the complex structure of coexistence and differentiation in the psychological bonds of food delivery riders, demonstrate the diversity of commitment in digital labor at the micro level, and provide empirical evidence for understanding labor-capital relations under algorithmic management.

Keywords: workers in new forms of employment, multifocal commitment, latent profile analysis, food delivery riders, algorithmic management

1. Introduction

The development of digital technology and the penetration of platform business models have given rise to new forms of employment represented by food delivery riders. Their labor process is increasingly dominated by platform rules and algorithmic systems, covering the entire chain of management from task assignment, route planning and performance evaluation to reward and punishment feedback [1]. Under such work arrangements, workers need to adjust their behaviors in response to constantly changing evaluation feedback and order-receiving rhythms, while maintaining their self-perception of occupational skills and occupational identity [2]. With the advancement of the rights and interests protection system for workers in new forms of employment, some workers obtain service support and a sense of collective belonging through trade union organizations, and thus the direction of their psychological bonds is no longer limited to a single object [3,4]. The commitment of platform workers may be directed at the platform as a management entity, trade unions as representatives and supporters of rights and interests, and the occupation itself as a carrier of self-worth, forming a psychological pattern of multifocal commitment. However, the

institutional logics and operational goals carried by these three commitment objects—the platform, trade unions and the occupation—are not entirely consistent, and even have potential tensions. Platform enterprises pursue operational efficiency and rule compliance, with algorithmic management as their core embodiment [5]; trade union organizations focus on safeguarding workers' rights and interests and coordinating labor relations [6]; occupational commitment is rooted in the recognition of professional skills, the pursuit of occupational autonomy and the expectation of long-term career development [7]. When multiple logics coexist, workers' psychological bonds to different objects do not necessarily covary in the same direction, but are more likely to form commitment structures with differentiated emphases, leading to intra-group differentiation.

Existing studies on organizational commitment, trade union commitment and occupational commitment mostly adopt a variable-centered perspective to test the antecedents and consequences of a single commitment focus or compare their independent net effects. Although this perspective can reveal the average effect at the aggregate level, it is difficult to present the compositional differences of multidimensional commitment at the individual level. For food delivery riders in similar algorithmic management contexts, even with similar levels of platform commitment, different combinations of trade union commitment and occupational commitment may correspond to distinct psychological contracts and adaptive orientations [8]. To make up for the above limitations, it is necessary to shift the focus from the strength of a single commitment focus to the compositional patterns of multidimensional commitment at the individual level, namely commitment profiles. This perspective emphasizes how platform commitment, trade union commitment and occupational commitment form a relatively stable compositional structure in the same worker, thus being more in line with the differences in psychological bonds beyond algorithmic management and more conducive to understanding the commitment differentiation within the group [9]. Based on this, this study identifies the multifocal commitment profiles among the sample of food delivery riders and completes the profile classification by using the latent profile analysis method.

Based on the above discussion, this study takes food delivery riders as the research object and focuses on the compositional patterns of their platform commitment, trade union commitment and occupational commitment at the individual level, so as to understand the differentiated presentation of psychological bonds in the context of algorithmic management. It mainly answers two questions: first, whether there are relatively stable latent profiles of multifocal commitment among food delivery riders; second, how the emphasis differences of different profiles on the three types of commitment can be depicted. By identifying and depicting these commitment profiles, this study strives to supplement the empirical evidence of workers' psychological bonds in the context of algorithmic management at the micro level, and provide enlightenment for thinking about differentiated organizational management and rights and interests service strategies.

2. Research design and result analysis

2.1. Research objects, data collection and sample description

This study takes food delivery riders who are simultaneously associated with platform enterprises, trade union organizations and occupational identity as the research objects. The survey was conducted in several provinces with vibrant platform economies and well-developed trade union construction, including Jiangsu, Zhejiang, Jiangxi, Guangdong and Hubei, to obtain a relatively diverse sample. Before the questionnaire distribution, the researchers explained the research purpose to the participants, emphasized the confidentiality and anonymity of the data, and interpreted key terms to reduce the impact of comprehension bias on data quality.

A two-wave time-lagged design was adopted for data collection. The first phase (T1) was conducted from August to September 2024, mainly measuring demographic variables, platform commitment, trade union commitment and occupational commitment; the second phase (T2) was implemented from January to February 2025, conducting a follow-up survey on the respondents in T1. A total of 298 initial questionnaires were collected. After data cleaning, invalid questionnaires with excessively short response time, regular answering and missing key information were excluded, and finally 208 valid matched samples were obtained, with an effective response rate of 69.8%.

The basic characteristics of the sample are as follows: food delivery riders are predominantly male (92.3%), aged 40 and below (78.4%), with an educational background of bachelor's degree or below for the vast majority (95.2%), and 38% have more than three years of working experience. In terms of platform distribution, Meituan Food Delivery is dominant (78.8%), and the delivery mode is mainly exclusive delivery (77.9%). On the whole, the sample is basically consistent with the common composition of the food delivery rider group in terms of demographic and employment characteristics, and can be used for subsequent analysis.

2.2. Variable measurement and correlation analysis

For the measurement of platform commitment, trade union commitment and occupational commitment, this study draws on the general scale of multifocal commitment developed by Klein et al [10]. This scale measures individuals' commitment to different targets based on a unified framework, and each commitment focus corresponds to four items, covering the core connotations of commitment: identification with the target, willingness to contribute, preference for choice, and sense of responsibility and concern. For example, the items measuring occupational commitment include "I am willing to make contributions to maintaining the occupational evaluation of the food delivery rider group"; the items measuring platform commitment include "Compared with other food delivery platforms, I am more willing to choose the current platform I use"; and the items measuring trade union commitment include "I am very concerned about the future development of the food delivery rider trade union". All scales have been appropriately contextually adjusted according to the food delivery work scenario, and measured by a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). This scale has good validity in measuring organizational, occupational and trade union commitment. In this study, the Cronbach's α coefficients of the three subscales of platform commitment, trade union commitment and occupational commitment are 0.805, 0.857 and 0.823 respectively, indicating that the measurement has good internal consistency reliability.

The results of correlation analysis show that platform commitment, trade union commitment and occupational commitment are all significantly positively correlated with each other (r values range from 0.257 to 0.748, $p < 0.01$). This indicates that at the overall sample level, the three types of commitment show a consistent variation trend; however, this does not exclude the possibility that at the individual level, workers' specific levels on different commitment dimensions may form diverse compositional patterns [9], which is also the starting point of this study for in-depth exploration from a person-centered perspective.

2.3. Determination of the number of latent profile categories

To identify the compositional patterns of food delivery riders in terms of platform commitment, trade union commitment and occupational commitment, this study adopted the latent profile analysis method. Using Mplus 8.3 software, with the three types of commitment as manifest variables, the

model parameters were estimated iteratively by the maximum likelihood estimation method. A series of comparative models were constructed by increasing the number of latent categories in turn (from 1 to 6), and the optimal number of profiles was determined by synthesizing information criteria indices, classification accuracy and statistical test results.

Table 1. Fit indices of the latent profile models

Class Model	AIC	BIC	ABIC	ENTRPY	LMR	BLRT	Class Proportion
1	3631.673	3651.669	3632.658	—	—	—	1
2	3186.032	3219.360	3187.675	0.987	<0.0001	<0.0001	0.184/0.816
3	3086.702	3133.360	3089.002	0.950	0.0019	<0.0001	0.353/0.179/0.468
4	2954.787	3014.776	2957.744	0.962	0.0046	<0.0001	0.174/0.232/0.121/0.473
5	2800.110	2873.429	2803.724	0.987	0.0965	<0.0001	0.077/0.174/0.271/0.357/0.121
6	2740.722	2827.373	2744.993	0.991	0.0037	<0.0001	0.169/0.077/0.270/0.005/0.358/0.121

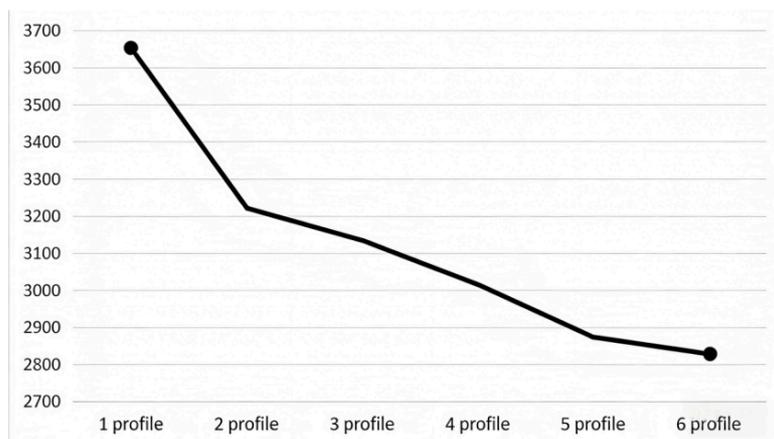


Figure 1. Elbow plot of BIC values

The model fit indices are shown in Table 1. The values of the information criteria indices AIC, BIC and ABIC all show a monotonically decreasing trend with the increase in the number of latent categories. At the same time, the Entropy values of all competing models are higher than the commonly used threshold of 0.80, indicating that the overall classification clarity of the models is good. In terms of likelihood ratio tests, the BLRT test is significant in all models, while the LMR test is not significant in the five-class model.

Since the information criteria indices decrease continuously without an obvious minimum value, referring to existing methodological suggestions, an elbow plot of BIC values changing with the number of categories was drawn to assist the judgment (see Figure 1). Although there is a visual elbow at the five-class model in Figure 1, the LMR test result of this model is not significant, meaning it is statistically unsupported to be superior to the four-class model. In addition, the six-class model contains a profile with an extremely small proportion, whose practical significance and stability are questionable; while the two-class model can only distinguish the level of commitment, and has limited explanatory power for the heterogeneity of the real context. After excluding the two-class model with insufficient explanatory power, the five-class model with insufficient statistical evidence and the six-class model with unfavorable profile size in turn, a re-examination of the elbow plot shows that the four-class model becomes a more appropriate elbow. Considering model

parsimony, the sufficiency of statistical evidence and the theoretical interpretability of the classification results, this study finally determined the four-profile model as the optimal solution.

2.4. Interpretation and naming of profile characteristics

Based on latent profile analysis, this study identified four significantly different multifocal commitment profiles among the food delivery rider group, reflecting the internal diversity of the commitment structure. Figure 2 shows the mean distribution of each profile on the three dimensions of platform commitment, trade union commitment and occupational commitment, revealing the systematic differences in the commitment compositional patterns among the rider group.

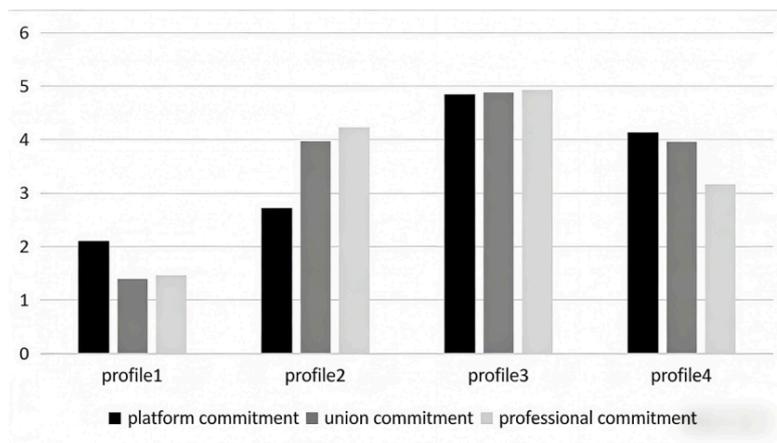


Figure 2. Four-profile model of food delivery riders

According to the results of latent profile analysis, four types of multifocal commitment profiles are identified. The first type is the "Platform Commitment-dominant Type" (accounting for 17.39%), whose platform commitment is slightly higher than trade union commitment and occupational commitment, and the overall level is low, showing an underdeveloped form characterized by compliance with platform rules as the main focus and weak other bonds. The second type is the "Trade Union-Occupation Dual-dominant Type" (accounting for 23.12%), with high levels of trade union commitment and occupational commitment but relatively low platform commitment, indicating that this group relies more on trade union support and occupational identification and has a relatively large psychological distance from the platform. The third type is the "Full Commitment Type" (accounting for 12.08%), which presents high and balanced levels on all three commitment dimensions, reflecting a synergistic identification with the platform, trade unions and the occupation. The fourth type is the "Platform-Trade Union Dual-dominant Type" (accounting for 47.34%), with high platform commitment and trade union commitment but relatively low occupational commitment, indicating that its psychological bonds are mainly anchored in the two types of organizational entities, and the sense of identification with occupational development is weak.

3. Conclusion

Based on an empirical investigation of food delivery riders, this study identified four types of profiles through latent profile analysis, namely the Platform Commitment-dominant Type, the Trade Union-Occupation Dual-dominant Type, the Full Commitment Type and the Platform-Trade Union Dual-dominant Type. The results show that in the labor process deeply involved in algorithmic

management, there is significant intra-group differentiation in workers' psychological bonds to the platform, trade unions and the occupation, presenting heterogeneous structural characteristics. This finding extends the perspective of heterogeneity and non-equivalence of organizational commitment [11] to the context of new forms of employment under algorithmic management.

Further analysis found that platform commitment and trade union commitment can coexist in specific profiles, which modifies the presupposition of a simple opposition between them. This suggests that in the Chinese context, the rights and interests protection function of trade unions may be perceived as valuable organizational support by some workers, thus forming a certain degree of compatibility with the platform logic [7]. At the same time, the existence of the "Trade Union-Occupation Dual-dominant Type" profile indicates that when coping with the uncertainty of algorithmic control [1], some workers are more inclined to rely on occupational identification and trade union collective support to establish a sense of stability, rather than strengthening one-way attachment to the platform, thus forming differentiated paths of psychological bond beyond algorithms [4].

These findings have enlightening significance for managerial practice. Platforms and trade unions need to recognize the inherent differences in the commitment structure of the rider group and implement targeted strategies. At the theoretical level, this study initially depicts the heterogeneous structure of multifocal commitment under algorithmic labor, providing a basis for understanding the psychological adaptation mechanism in digital labor relations. However, limited by cross-sectional data and a specific sample, future research can expand the sample coverage, include non-union members for comparison, and adopt a longitudinal design to reveal its antecedents, consequences and evolutionary trajectory more dynamically, thus deepening the understanding of the essence of digital labor relations.

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